SHORT-JOINT BEAVERTAIL
Opuntia basilaris Engelm. & Bigel. var. *brachyclada* (Griffiths) Munz

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Management Status: Federal: USFWS Species of Concern
California: S1.2, G5T1 (CDFG, 1998)
CNPS: List 1B, R-E-D code 3-2-3 (Skinner and Pavlik, 1994)

General Distribution:

Short-joint beavertail occupies northern slopes of the San Gabriel Mountains. It occurs from Quigley Canyon and ranges east northeast to the Anaverde Valley west of Palmdale. From there, it appears to follow the San Andreas rift zone to the Cajon Pass, although it departs somewhat from the rift zone near Mill Creek Summit within the Angeles National Forest. It occurs mostly at elevations between 3000-6500 ft. (900-2000 m). However, the westernmost reported location in Quigley Canyon near Newhall is at 1400-1600 ft. (425-490 m). The University of California at Riverside herbarium has a collection from Pole Canyon, near the Santa Clara River off of Soledad Canyon Road approximately 12-15 mi. (19-24 km) northeast of Newhall, and there is a report from Quail Spring about five miles east of that, but in general, there are very few reports from areas between Quigley Canyon and the Anaverde Valley. Plants from the Anaverde Valley and west of there appear to have intermediate morphology, and are probably intergrades with *Opuntia basilaris* var. *basilaris*. There are several reports east of Cajon Pass in the northern San Bernardino Mountains, extending through Horsethief Canyon and Summit Valley to the Mojave River Forks south of Hesperia. Most of these populations also show intergradation with *Opuntia basilaris* var *basilaris*. It also occurs on the coastal slope of the transverse ranges in the Cajon Pass area at Mormon Rocks.

There is a 1920 collection from the eastern side of the Providence Mountains at Colton Well (CDFG, 1997b) that is reported to be this variety, but the plants could not be found there when the site was checked in 1979. A CNPS field survey form indicates that short-joint beavertail was found at or near this location in 1983, apparently by Maureen Pendleton, but this information did not appear in the CNDDB (CDFG, 1997b), and it is not certain whether there is a voucher specimen available. This location is a considerable distance from the main part of the range for this taxon, and it is possible that plants found here are not true variety *brachyclada*. Short-joint beavertail has also been reported from Vulcan Mountain in San Diego County, also a long distance from the taxon's main range (Benson 1969). Surveys should be conducted in the Providence Mountains and Vulcan Mountain to determine if this variety indeed occurs there. The 1995 administrative review draft for the WMPA reports that new populations of short-joint beavertail have been found near Isabella Lake, but CNDDB reports for these populations were not available, and pending firm documentation this population cannot be accepted as valid.

Distribution within the West Mojave Planning Area:

Within the WMPA, short-joint beavertail is reported in the Anaverde Valley just west of Palmdale, and from there it follows the San Andreas rift zone, both in the Angeles National Forest

and in the WMPA, southeast to Largo Vista. East of Largo Vista its distribution within the WMPA is mostly north of the rift zone near the Forest Service boundary to near Mountain Top at the junction of Highway 138 and Highway 2. Scattered plants have been observed within the WMPA in south Phelan, east of Mountain Top, for several miles along the Forest Service boundary. Plants then reappear near Cajon Summit, Oak Hills, and Baldy Mesa. From there it extends east through Horsethief Canyon, mostly within the San Bernardino National Forest, but sometimes extending into the WMPA. Its eastern-most reported occurrence within the WMPA is near the dam at Deep Creek and Mojave River Forks.

Natural History:

Short-joint beavertail is a member of the cactus family (Cactaceae), and more specifically fits within the sub-genus *Platyopuntia* of the genus *Opuntia*, having flattened joints and no tubercles. It has bluish-gray stems with no spines, but possesses glochids borne on areoles 0.2-0.6 in. (0.5-1.5 cm) apart. The fruit is dry at maturity. Flowers have magenta to rose-colored perianth segments and white stigmas, and are clustered at the ends of joints. Variety *brachyclada*, first described by Griffiths (1914), is distinguished from other members of the species by having small joints which are 1.2-2.4 in. (3-6 cm) long, rather than the 2.8-6.0 in. (7-15 cm) long joints possessed by other members of this species. These joints are often almost cylindrical and club-shaped instead of flattened (Hickman, 1993; Munz, 1974), but older joints within a clone seem to flatten as they age. Fruits are also smaller at 0.4-0.8 in. (1-2) cm, compared to fruits of other varieties which are 1.2 in. (3 cm) long. Flowers, however, are not always smaller; plants in pinyon-juniper woodland in Pinon Hills have been observed with flowers as large as those of other varieties. It flowers in May to June, a month later than other varieties, and has been called the 'snow flower cactus' because the flowering follows snow melt in pinyon woodland (Dawson, 1966).

The characteristics that distinguish the short-joint beavertail from var. *basilaris* are at least in part due to genetic differences, since some individual plants of both varieties maintain distinct phenotypes when growing sympatrically, as in Horsethief Canyon (MacKay and Sanders, 1997). It is not known whether any of the unique features of the short-joint beavertail help them to survive and/or reproduce more efficiently within their range. It was speculated that this taxon could be of hybrid origin between a cylindric species and a flat-jointed species (Britton and Rose, 1963), and although hybrids are found within both sub-genera (Gibson and Nobel, 1986), it is now clear that hybrids do not occur between the sub-genera *Cylindropuntia* and *Platyopuntia*.

Like all of the southwestern *Platyopuntias*, short-joint beavertail flowers are large, bowl-shaped, have many brightly-colored perianth segments, many touch-sensitive stamens, and a massive central style and stigma. Transfer of pollen by vectors is probably important in this taxon, as it is in many protandrous cacti (Mistretta and Parra-Szijj, 1991). Flowers with this pollination syndrome were previously thought to be beetle-pollinated (Faegri and van der Pijl, 1979; Grant and Hurd, 1979), and indeed, beetle visitors are very commonly reported in these flowers. However, more recent studies have shown that the beetles found in cactus flowers do not frequently contact stigmatic surfaces, and that medium-sized and larger bees are the important regular pollinators of this and other *Platyopuntias* (Grant and Grant, 1979, Grant and Hurd, 1979).

Seeds of the short-joint beavertail will germinate under greenhouse conditions at temperatures greater than 70 F, but sometimes scarification is required (Mistretta and Parra-Szijj, 1991). The

presence of what appear to be hybrid swarms, especially east of Cajon Pass in Summit Valley, would suggest that viable seeds are produced by crosses with var. *basilaris*. Both varieties are diploid with the same chromosome number (2n=22) (Pinkava, et. al. 1977). Seeds of plants from an apparent hybrid swarm population in Horsethief Canyon showed 95% embryo viability when tested with tetrazolium (MacKay, 1998). Cloning is also evident in short-joint beavertail from the formation of spreading patches of this taxon in some areas. It has been suggested that patch width might be used to estimate ages of plants, although growth rates and longevity of the short-joint beavertail are not known (Mistretta and Parra-Szijj, 1991). However, most plants don't produce multiple joint segments that will break off and be dispersed, so cloning may be limited (Mistretta and Parra-Szijj, 1991). The juicy bright colored fruits of the short-joint beavertail are most likely dispersed by birds, but the seeds do not appear to germinate within the fruit itself, probably due to the presence of chemicals in the pulp that inhibit seed germination (Mistretta and Parra-Szijj, 1991). Seeds might be eaten by insects, rodents, and birds. Cochineal insects (*Dactylopius coccus*) have been observed on short-joint beavertail, but they do not appear to threaten the survival of the plants (Mistretta and Parra-Szijj, 1991).

Habitat Requirements:

Short-joint beavertail is known to occur in chaparral, joshua tree woodland, Mojave Desert scrub, and pinyon-juniper woodland communities at elevations of 3000- 6500 ft. (900-2000 m). Within the WMPA it is mostly associated with Joshua tree (*Yucca brevifolia),* California juniper *(Juniperus californica),* scrub oak *(Quercus john-tuckeri),* ceanothus *(Ceanothus greggii),* California buckwheat (*Eriogonum fasciculatum* var. *polifolium),* pinyon pine (*Pinus monophylla),* purple sage *(Salvia dorrii),* and linear-leaved goldenbush (*Ericameria linearifolia).* Within the Angeles National Forest it is associated with chamise (*Adenostema fasciculatum*), ceanothus (both *Ceanothus crassifolius* and *Ceanothus greeggii* var. *vestitus*), the Lord's candle (*Yucca whipplei* ssp. *caespitosa*), California sycamore (*Platanus racemosa*), chaparral white-thorn (*Ceanothus leucodermis*), big-berried manzanita (*Arctostaphylos glauca*), sugar bush (*Rhus ovata*), silk-tassel bush (*Garrya veatchii*), big sagebrush (*Artemisia tridentata*), Mexican elderberry (*Sambucus mexicana*), rubber rabbitbrush (*Chrysothamnus nauseosus*), yerba santa (*Eriodictyon trichocalyx*), and other species. It has been reported from a wide variety of soils, from sandy to rocky, in open stream beds and on rocky slopes (CDFG, 1997b).

Population Status:

CNDDB reports for short-joint beavertail have very little information on population sizes within the WMPA, and there is no information on trend at reported sites. Many of these reports indicate single plants, while others have no data on numbers of plants (CDFG, 1997b). Known occurrences within the WMPA will be discussed, starting with the westernmost location at Quigley Canyon. There are no population data for the Quigley Canyon population, and plants there appear to be intergrades with *O. basilaris* var. *basilaris*. In 1989 Myers (CDFG, 1997b) reported four locations at City Ranch in the Anaverde Valley west of Palmdale, many of the which appeared to be intergrades with *O. basilaris* var. *basilaris* . One of these locations had 300 plants, while another had 12. There are no further population data for these locations, nor are there counts for the other two Anaverde populations. A population with at least 23 individuals was found south of Palmdale near an air strip in an area a developer retained as natural open space (CDFG, 1997b), but there is no current information on the status of that population. An

unknown number of short-joint beavertail were found at Big Rock Creek, east of Pearblossom. These were unusual in that they occurred in creosote bush scrub habitat.

Although it is not within the WMPA, MacKay and Thomas (1997) have recently discovered a large population of at least several hundred plants further up the Big Rock Creek drainage at 5250 ft. (1600 m) elevation. These plants are on private land at the old Paradise Springs Camp, and the naturalist at that camp has been notified. A smaller and less dense population was observed at South Fork Campground, also outside of the WMPA. It is likely that the short-joint beavertail also occurs along Rock Creek between Pearblossom and South Fork Campground within the WMPA, but this has not been documented.

A population on Largo Vista Road, near highway N-4, extends slightly over the Angeles National Forest boundary into the WMPA. Mistretta and Parra-Szijj (1991) reported 140 plants for the whole population, but it is not known how many of these were within the WMPA. Several populations occur in Mescal Canyon (CDFG, 1997b), but there are no population size data available. MacKay has frequently observed short-joint beavertail at many scattered locations in Pinon Hills and south Phelan. Plants were never dense in these areas, and population data were not taken. A population of 150 plants extends into the WMPA from the Angeles National Forest (Mistretta and Parra-Szijj, 1991) in Horse Canyon, but it is not known how many of these plants are actually within the WMPA.

Several populations have been found in the Oak Hills and Baldy Mesa areas. In 1986, one plant was found in Baldy Mesa, three miles north of Cajon (CDFG, 1997b), an unknown number of plants were found at Newton's Outpost Truck Stop on the west side of Highway 395, and one plant was found at the I-15 freeway and Highway 395 exit. Five more populations were found scattered within the Oak Hills and Baldy Mesa area.

MacKay and Sanders (1997) have observed populations of 25 or more individual plants in Horsethief Canyon east of Cajon Pass, along the Pacific Crest Trail. These plants were mostly outside of the WMPA, although some of them may extend into the WMPA. Many of these plants appear to be intergrades with *O. basilaris* var. *basilaris*, although some specimens retain all of the characteristics of var. *brachyclada.* Meyers also has found short-joint beavertail populations that lie at least partly within the WMPA, at Las Flores Ranch, Grass Valley, and Deep Creek Dam, but population sizes were not assessed.

Mistretta and Parra-Szijj (1991) have conducted surveys for short-joint beavertail within the Angeles National Forest. They counted a total of approximately 900 plants at fifteen localities, two of which were within the boundaries of the San Bernardino National Forest. Plants were found in the Tujunga and Valyermo Districts of the Angeles National Forest, and in Lone Pine Canyon in the San Bernardino National Forest.

It is likely that the distribution of the short-joint beavertail is much wider within the WMPA than what is described here. Much of the land is in private hands, making field surveys difficult.

Threats Analysis:

Most of the short-joint beavertail range that is within the WMPA in San Bernardino County is on private land, and these plants are threatened with mechanical removal by Off Highway Vehicles (OHVs) and by residential construction. There has been a marked human population increase in the vicinities of Pinon Hills, Phelan, and Oak Hills due to development of home sites, and much of the remaining land is zoned for residences. Many of the developed and undeveloped lots are between two and a half and five acres (1-2 ha). There is a tendency for residents to clear their acreage of native vegetation, mostly since it considered a fire hazard, but also to build corrals for animals. In addition, many residents do not like having cacti on their property, as they feel cacti pose a danger to children and animals. However, some property owners in Pinon Hills are aware of the unique nature of the short-joint beavertail, and encourage it to grow in their rock gardens. Away from the residential areas, prime short-joint beavertail habitat in the hills south and east of Phelan, from Cajon Canyon extending to the Oak Hills and Cajon Pass area, is used extensively by OHV enthusiasts. Much of the landscape is scarred by OHV trails, and erosion is apparent in many places. In addition, undeveloped homesites at lower elevations are often traversed by OHVs, especially those lots that are not protected by fences and signs.

Future activity at a presently inactive limestone mine could potentially threaten a population northeast of Wrightwood. Sheep grazing in the Baldy Mesa area could pose a threat from trampling of plants, but it is unlikely that the sheep find the cacti palatable. Short-joint beavertail east of the Cajon Pass in the Summit Valley area is greatly threatened by the proposed and approved Las Flores Ranch housing development. In addition, a housing development is planned south of Hesperia near Hesperia Airport. Land-clearing for construction of roads, utilities, and buildings will cause mechanical removal of these plants.

At Quigley Canyon, there are major disturbances due to oil drilling. Continued urbanization around the Palmdale area has most likely had heavy impacts on short-joint beavertail populations, but these impacts are not documented. The known populations are all on private land, some of which is being developed as residences, as in the Anaverde Valley, and a population has been found at an air landing strip southeast of the city. In general, however, impacts to short-joint beavertail habitat in Los Angeles County have probably not been as great as in San Bernardino County. The Los Angeles County Planning Dept. has designated several Significant Ecological Areas (SEA) within the range of this species, including Littlerock, Big Rock Creek, and Mescal Canyon, close to the San Bernardino County line, although a water pipeline has been proposed in the Mescal Canyon area. Developing a homesite within an SEA sometimes requires dedication of fifty per cent of the land as conservation easements to be maintained as open space. In addition, amenities such as water and electricity are absent from many of these areas in Los Angeles County, so there is less incentive to build there. Even though this land is in private hands, the result has been a much lower density of development, and therefore far fewer impacts on the short-joint beavertail so far. It must be kept in mind, however, that human populations in nearby Palmdale and Lancaster urban areas are expected to increase sharply in the near future, and utilities will most likely increase in availability, making this area prime for development.

Where the short-joint beavertail occurs in Los Angeles County on USFS land, it is not threatened by homesite development. However, large expanses of this land are designated for off-road vehicle travel, from Bear Canyon just east of Placerita Canyon, and east to a point just south of Littlerock. The same designation applies to USFS areas from near Valyermo and east to the

San Bernardino County line. This includes the upper reaches of Mescal Canyon where populations of short-joint beavertail have been reported. Scattered off-road tracks were found in this area during a habitat integrity survey (MacKay and Thomas, 1997), but many places were too steep and the vegetation too dense and impenetrable to allow intense OHV travel.

The unique compact form and beautiful flowers of the short-joint beavertail make it very desirable for cactus collectors. It is not known if horticultural collection has impacted populations within the WMPA, but there is the potential for future impacts from this activity.

Most species of *Opuntia* evolved in areas where they were not subjected to frequent fires (Sauer, 1988). It has been suggested that the rapid infiltration of desert ecosystems by introduced grasses most likely increases fire frequency, and this may decimate some *Opuntia* species (Sauer, 1988). Introduced European grasses are increasing their range and numbers within the range of the short-joint beavertail, especially in the Cajon Pass area, Oak Hills, Phelan, and Pinon Hills, and also around Palmdale. This will most likely alter future fire frequency, but it is unclear if this increased frequency will pose a threat to the short-joint beavertail. In addition, prescribed burning has been planned in desert chaparral areas within the range of this taxon (Mistretta and Parra-Szijj, 1991). These cacti can apparently survive at least a single burning incident. A resident of Pinon Hills reported that several large patches of this plant on her property at 5000 ft. burned completely in the Scout Fire of June 1994. They have now resprouted from patch edges, but have not yet flowered . One of these burned patches near a garden area, which therefore receives extra water, has attained larger joint length than other patches receiving no extra water.

Biological Standards:

To prevent extirpation of short-joint beavertail within the WMPA, it is first necessary to determine where it is found and to assess population sizes. Focused surveys must be carried out prior to making management decisions, and mitigation measures must be carried out both on public and private land.

Natural areas should be set aside within lots to be developed, where property owners are not permitted to clear portions of the land or disturb the plants. It is also possible to successfully transplant the short-joint beavertail, so isolated plants could be transferred to more protected locations. Perhaps a tax incentive could help motivate land owners to carry out mitigation measures with monitoring from local agencies.

Los Angeles County Planning Department growth projection estimates should be consulted to foresee the potential for habitat loss in this region. The county should require that extra mitigation measures be taken when development occurs where this species is present. In 1991, an action plan was developed to eliminate threats to the short-joint beavertail within the Tujunga and Valyermo Districts of the Angeles National Forest. This plan was to be implemented and overseen by the Angeles National Forest and Rancho Santa Ana Botanic Garden (Mistretta and Parra-Szijj, 1991). It is not known whether this plan is being carried out.

OHV use must be curtailed on privately-owned acreage in residential areas, and especially in the area southeast of Phelan and east of Mountain Top junction, between Cajon Canyon and Cajon Pass.

Research is needed to determine if short-joint beavertail survives repeated frequent fire, and what effects fire has on seed survival and germination; such information could help determine appropriateness of management practices such as prescribed burning.

Genetic studies would not only help to elucidate the typical reproductive strategy employed by this taxon (Karron, 1991), but could offer critical information on the genetic diversity within this taxon and the likelihood of its persistence through time (Huenneke, 1991).

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